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ORIGINAL ARTICLE/ARAŞTIRMA MAKALESİ

Factors Associated with Health Literacy and Diabetes Burden, and the Relationship Between Health Literacy and Diabetes Burden in Elderly Individuals with Type 2 Diabetes Mellitus

Tip 2 Diyabetli Yaşlı Bireylerde Sağlık Okuryazarlığı ve Diyabet Yükü ile İlişkili Faktörler ve Sağlık Okuryazarlığı ile Diyabet Yükü Arasındaki İlişki

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ABSTRACT

Aim: Our study aims to investigate factors associated with health literacy and diabetes burden and the relationship between health literacy and diabetes burden in elderly patients with type 2 diabetes mellitus.

Materials and Methods: This descriptive study included 124 elderly patients with type 2 diabetes mellitus who applied to the endocrinology and metabolic diseases outpatient clinic of a university hospital between January 2019 and June 2019. All the patients met the inclusion criteria. Sociodemographic characteristics and health information form, Health Literacy Scale, and Elderly Diabetes Burden Scale were used as research tools in the study.

Results: 54% of the participants were women, and 76.6% were aged 65-74. A statistically significant difference was found in the total health literacy scores of the patients in terms of educational level, health status, income status, presence of chronic complications, presence of retinopathy, and nephropathy. A statistically significant difference was also found in the total scores of the Elderly Diabetes Burden Scale in terms of gender, educational level, health status, presence of other chronic diseases, duration of diabetes, types of diabetes treatment, presence of chronic complications, presence of retinopathy, nephropathy, neuropathy, and coronary artery disease. According to Spearman's correlation coefficient analysis, a moderate negative correlation was found between the patients' Health Literacy total score and Elderly Diabetes Burden Scale total score.

Conclusion: In our study, it was determined that the burden of diabetes decreased as health literacy increased. Health professionals should focus on improving health literacy so that elderly diabetic patients can lead a more comfortable life, increase their ability to cope and adapt to the disease, and reduce the burden of diabetes.

Keywords: Elderly, Health Literacy, The Burden Of Diabetes, Type 2 Diabetes Mellitus

ÖZ

Amaç: Bu araştırmanın amacı, tip 2 diyabetli yaşlı bireylerde sağlık okuryazarlığı ve diyabet yükü ile ilişkili faktörler ve sağlık okuryazarlığı ile diyabet yükü arasındaki ilişkiyi incelemektir.

Gereç ve Yöntemler: Araştırmamız tanımlayıcı bir çalışmadır. Araştırmaya Ocak 2019 ve Haziran 2019 tarihleri arasında bir üniversite hastanesinin endokrinoloji ve metabolizma hastalıkları polikliniğine başvuran tip2 diyabetli 124 yaşlı hasta dahil edilmiştir. Tüm hastalar çalışmaya dahil edilme kriterlerini karşılamaktadır. Araştırmada katılımcıların sosyodemografik özellikleri ve sağlık bilgileri formu, sağlık okuryazarlığı ölçeği ve yaşlılarda diyabetin yükü ölçeği kullanılmıştır.

Bulgular: Katılımcıların %54'ü kadın, %76,6'sı 65-74 yaşları arasında idi. Hastaların sağlık okuryazarlığı düzeyi ile eğitim düzeyi, sağlık durumu, gelir durumu, kronik komplikasyon varlığı, retinopati ve nefropati varlığı arasında istatistiksel olarak anlamlı fark bulunmuştur. Yaşlı diyabet yükü ile cinsiyet, eğitim düzeyi, sağlık durumu, başka kronik hastalık varlığı, koroner arter hastalığı, diyabet süresi, diyabet tedavi şekli, kronik komplikasyon varlığı, nefropati, nöropati ve retinopati varlığı arasında da istatistiksel olarak anlamlı fark bulunmuştur. Spearman korelasyon katsayısı analizine göre hastaların sağlık okuryazarlığı toplam puanı ile Yaşlı Diyabet Yükü Ölçeği toplam puanı arasında orta düzeyde negatif korelasyon bulunmuştur.

Sonuç: Çalışmamızda sağlık okur yazarlığı arttıkça diyabet yükünün azaldığı saptanmıştır. Sağlık profesyonelleri yaşlı diyabetik hastaların daha konforlu bir yaşam sürdürebilmeleri, hastalıkla baş etme ve uyum gösterebilme yeteneklerinin artırılması ve diyabet yükünün azaltılması için sağlık okuryazarlığının artırılmasına odaklanmalıdır.

Anahtar Kelimeler: Diyabet Yükü, Sağlık Okuryazarlığı, Tip 2 Diabetes Mellitus, Yaşlı

INTRODUCTION

The concept of health literacy (HL) encompasses the ability to acquire, understand and use health information to protect and improve health (1,2). Low levels of HL appear to be a significant indicator of adverse health outcomes for many chronic diseases. With a growing older population, the number of elderly diabetic patients has risen significantly. Elderly diabetic patients have more complications, and they have more inadequate capacity to manage the disease than younger patients (3). To provide a high level of self-care for diabetic patients, they must have the ability to decide and apply specific knowledge in more than one area. For this, they need to have sufficient HL (4). High HL levels increase self-awareness and coping strategies in patients with diabetes (5). In addition to physical changes, diabetic patients also experience some emotional, mental, and social problems and conflicts. Anxiety, depression, stress, and loss of social support experienced by patients with diabetes exacerbate the disease and increase the burden of diabetes (6). Diabetes creates a severe disease burden on individuals due to its increased incidence with increasing age, long duration of treatment, high mortality rate, and the risk of many complications (7,8).

Diabetes education can decrease risk factors and risks for complications of diabetes. In many studies, it has been determined that low HL leads to high diabetes burden (symptom burden, social burden) (9–13). Low HL is associated with a poor understanding of the health status of patients with chronic diseases, compliance with medical recommendations, inadequacy in self-care, and increased mortality rates (14). A study by Akyol Güner et al. determined that HL and rational drug use of patients with diabetes were insufficient. It has been stated that these two conditions have a strong positive relationship (15).

We attach particular importance to conducting extensive research on the effects of HL on elderly individuals with chronic diseases. Understanding the role of HL in diabetes management and patient education will help increase the knowledge and skills of diabetic patients about their illnesses and prevent adverse health outcomes. Since the number of studies in this area is low, we believe it is necessary to research HL and the burden of diabetes so as to maximize access to healthcare services, particularly for older adults with diabetes mellitus. Our study aims to investigate factors associated with HL and diabetes burden and the relationship between HL and diabetes burden in elderly patients with type 2 diabetes mellitus (T2DM).

MATERIALS AND METHODS

In this cross-sectional study, among the patients who applied to an endocrinology and metabolic diseases outpatient clinic of a university hospital between January 2019 and June 2019, 124 diabetic patients met the following inclusion criteria and volunteered to participate included in this study.

Inclusion criteria:

Participant must:

Have been ≥65 years old.

Have been diagnosed with T2DM for at least one year.

Not have been a cognitive disability to prevent communication.

The face-to-face interview method was used for collecting data from participants.

Tools Used in Research

Sociodemographic (age, gender, education, marital status, income level, residence) and health-related characteristics [health status, presence of other chronic diseases, duration of diabetes, types of diabetes treatment, chronic complications of T2DM, whether the patient received diabetes education, whether it was sufficient, level of physical exercise, and laboratory values (fasting blood glucose-FBG and A1c)] were recorded. Sufficiency of diabetes education was assessed with the self-assessment

of the participants.

The 47-item Health Literacy Survey in Europe scale developed by Sorensen was later simplified by Toçi et al. (16,17). The Turkish validity and reliability of the scale were made by Aras and Bayık Temel (18). The Health Literacy Scale (HLS) is comprised of 25 components and four sub-scales. Access to information consists of five components (items 1 to 5), the minimum and maximum scores to be obtained from this subscale are 5 and 25, respectively. Understanding health-related information consists of seven components (items 6 to 12); this subscale's minimum and maximum scores are 7 and 35, respectively. The evaluation consists of eight components (items 13 to 20), the minimum and maximum scores to be obtained from this subscale are 8 and 40, respectively. Apply / use of health-related information also consist of five components (items 21 to 25), the minimum and maximum scores to be obtained from this subscale are 5 and 25, respectively. The minimum and maximum scores to be accepted for the whole scale are 25 to 125. Participants used Likert-type scale response options: "5 = I have no problem, 4 = I have a minor problem, 3 = I have some problem, 2 = I have a serious problem, 1 = I cannot do it / I have no ability". All components on the scale have a positive structure. As the score increases, the HL level of the people increases. The Cronbach alpha values of the HLS were found to be 0.97, and the Cronbach alpha values determined for the subscales were found to be between 0.79 and 0.96.

The Elderly Diabetes Burden Scale (EDBS) was developed by Araki et al. (19). The validity and reliability study of EDBS for Turkish was made by Yıldırım-Usta and Esen (20). It is comprised of 22 components and six sub-scales. The minimum and maximum scores to be obtained for the whole scale are 18 to 88. The increase in the scale scores indicates that the burden of the disease increases, and the decrease in the scores indicates that the burden of the disease decreases. The scale has no cut-off point. Six sub-scales are as follows: Symptom burden (0-16), social burden (5-20), burden from dietary restrictions (4-16), burden from anxiety about diabetes (4-16), burden related to treatment dissatisfaction (2-8), and burden from tablets or insulin (3-12). The Cronbach alpha values of the DBS were found to be 0.90, and the Cronbach alpha values for its subscales were found to be between 0.64 and 0.99.

This research was performed in accordance with the Helsinki Declaration and *was approved by* the Medical Research Ethics Committee of Akdeniz University, Faculty of Medicine (Date: 26.12.2018- Approval Number: 921). All participants gave their informed consent at the beginning of the study.

Statistics

The data obtained from the research was evaluated using IBM SPSS 20.0 program. Descriptive statistics were used for data evaluation. The data were presented with median (minimum–maximum), number, percentage distribution, and mean ± standard deviation (SD). The Mann-Whitney U test was used to compare differences between two independent groups, while the Kruskal Wallis Test was used for more than two groups. The Kolmogorov-Smirnov test was used to evaluate the normal distribution. Spearman Correlation analysis was performed to determine the relationship between the EDBS total score and the HLS total score. After the Kruskal-Wallis test, Dunn's test was performed with Bonferroni correction for pairwise comparisons. A p-value < 0.05 was interpreted as statistically significant.

RESULTS

This study enrolled 124 patients with type 2 diabetes mellitus aged ≥65 years. 54% of the participants were women, and 76.6% were aged 65-74. (Table I). The mean A1c of the patients was 7.44 ± 1.33% (3.8-13.5%), and the mean FBG was 142.30 ± 56.88 mg/dL (51-449). The sociodemographic and health-related characteristics of the patients are shown in Table I. The mean and median (minimum-maximum) scores of the HLS and EDBS total scores and their

subscales are shown in Table II. According to the Kolmogorov-Smirnov test, the HLS total scores were not in compliance with normal distribution, and the total scores of the EDBS were found to be under a normal distribution. The mean DBS total score of the elderly individuals was found to be 43.79 ± 12.19. A moderate burden was observed.

Table I. Sociodemographic and health-related characteristics of participants

Characteristics	n	%
Sociodemographic characteristics		
Gender		
Female	67	54.0
Male	57	46.0
Age, year		
65-74	95	76.6
≥ 75	29	23.4
Educational level		
Illiterate	16	12.9
Primary school	54	43.5
Secondary school	11	8.9
High school	18	14.5
University or above	25	20.2
Marital status		
Married	92	74.2
Widowed-Divorced	32	25.8
Income status		
Good	15	12.1
Moderate	105	84.7
Low	4	3.2
Place of residence		
Village/Town	19	15.3
City Center	105	84.7
Health-related characteristics		
Health status		
Good	18	14.5
Fair	85	68.5
Poor	21	16.9
Presence of other chronic disease		
Yes	103	83.1
No	21	16.9
Duration of diabetes, years		
1-5	20	16.1
6-10	19	15.3
11-15	24	19.4
16 and over	61	49.2
Types of diabetes treatment		
OAD	71	57.3
Insulin	17	13.7
OAD + Insulin	34	27.4
Diet only	2	1.6
Presence of chronic complication	85	68.5
Retinopathy	45	36.3
Nephropathy	33	26.6
Neuropathy	51	41.1
CAD	29	23.4
Diabetic foot	7	5.6
Received diabetes education?	121	97.6
Yes	3	2.4
No		
Is his/her education adequate?	121	97.6
Yes	3	2.4
No		

Abbreviations: n, number of patients; OAD, oral antidiabetic drug; CAD, coronary artery disease

A statistically significant difference was found between the HL level and their income status, presence of chronic complications, and presence of retinopathy and nephropathy ($p < 0.001$; 0.015; 0.003; 0.009, respectively) (Table III).

There was a significant difference between the HL level and education ($p<0.001$) (Table III). After a dual rating between groups was performed, it was found that the scores of illiterate participants were lower than the scores of primary school graduates, secondary school graduates, high school graduates, and university graduates ($p<0.001$; $p<0.001$; $p<0.001$; $p<0.001$, respectively). At the same time, the scores of high school graduates were higher than primary school graduates ($p=0.021$).

Table II. Mean scores of scales and subscales		
SCALES	**Mean ± SD**	**Median (min-max)**
HL		
Access	17.66 ± 5.92	17 (5-25)
Understanding	25.10 ± 6.57	27 (7-35)
Evaluation	31.32 ± 6.28	32 (14-40)
Apply	18.34 ± 3.22	19 (11-25)
HL Total	92.44 ± 20.13	95 (42-124)
EDBS		
EDBS 1. Symptom burden	6.67 ± 4.15	6.5 (0-16)
EDBS 2. Social burden	9.87 ± 3.88	10 (5-17)
EDBS 3. Burden stemming from dietary restrictions	10.03 ± 3.49	10 (4-16)
EDBS 4. Burden stemming from anxiety about diabetes	8.87 ± 3.38	8 (4-16)
EDBS 5. Burden related to treatment displeasure	2.11 ± 0.48	2 (2-5)
EDBS 6. Burden stemming from oral antidiabetics or insulin	6.22 ± 2.51	6 (3-12)
EDBS Total	43.79 ± 12.19	43 (18-69)
Abbreviations: SD, Standard Deviation; EDBS, Elderly Diabetes Burden Scale; HL, Health Literacy; Min, minimum; Max, maximum		

There was a significant difference between the HL level and health status (p=0.001) (Table III). After a dual rating between groups was performed, the HL score of participants who assessed their health status as good was significantly higher than that of participants who considered their health status as fair and poor (p=0.001, p=0.007, respectively).

Moreover, a statistically significant difference was also found in the EDBS scores and gender, presence of other chronic diseases, presence of chronic complications, presence of retinopathy, nephropathy, neuropathy, and coronary artery disease (p = 0.008; 0.011; <0.001; <0.001; <0.001; 0.001; 0.001, respectively) (Table III).

There was a significant difference (p<0.001) between the EDBS scores and education (Table III). After a dual rating between groups was performed, it was found that the scores of university graduates were lower than the scores of illiterate participants (p<0.001) and primary school graduates (p=0.029).

There was a significant difference between the EDBS scores and health status (p<0.001) (Table III). After a dual rating between groups was performed, the EDBS score of participants who assessed their health status as poor was significantly higher than that of participants who considered their health status as fair and good (p=0.006, p<0.001, respectively).

There was a significant difference between the EDBS scores and the duration of diabetes (p=0.005) (Table III). After a dual rating between groups was performed, the average EDBS score of participants whose duration of diabetes was more than 16 years was significantly higher (p=0.011) than the score of those whose duration of diabetes was 6 to 10 years.

There was a significant difference between the EDBS scores and types of diabetes treatment (p<0.001) (Table III). After a dual rating between groups was performed, the EDBS score of participants who were treated with only oral antidiabetics (OAD) was found to be significantly lower than that of participants who were treated with OAD and insulin (p=0.002) and who treated with only insulin (p=0.014).

According to Spearman's correlation coefficient analysis, a moderate negative correlation was found between the HL total score (92.44 ± 20.13) and the EDBS total score (43.80 ± 12.19) (rspearman = -,41, p <0.001).

There was a negative and nonsignificant relationship between FBG and A1c values and the HL total score; and a positive and nonsignificant relationship in the case of the EDBS total score.

Table III. The relationship between the sociodemographic and health-related characteristics of the patients and their total HLS and EDBS scores

Characteristics	HL Total score	p	EDBS Total score	p
Age, year				
65-74 (n=95)	93.42 ± 19.94 (42-124)	0.313	43.31 ± 12.54 (18-69)	0.462
≥75 (n=29)	89.24 ± 20.78 (52-123)		45.38 ± 11.03 (27-67)	
Gender				
Female (n=67)	89 ± 23.23 (42-124)	0.198	46.64 ± 13.28 (18-69)	**0.008**
Male (n=57)	96.49 ± 14.94 (63-123)		40.46 ± 9.88 (19-63)	
Marital status				
Married (n=92)	95.03 ± 18.42 (42-124)	0.058	43.60 ± 12.78 (18-69)	0.562
Widowed-Divorced (n=32)	85 ± 23.14 (46-117)		44.37 ± 10.48 (18-67)	
Place of residence				
Village-Town (n=19)	88.21 ± 20.49 (46-122)	0.314	46.79 ± 10.72 (26-69)	0.195
City Center (n=105)	93.21 ± 20.07 (42-124)		43.26 ± 2.41 (18-69)	
Educational level				
Illiterate (n=16)	60.19 ± 12.51 (42-85)	**<0.001**	53.62 ± 11.24 (33-69)	**<0.001**
Primary school (n=54)	90.07 ± 15.96 (54-118)		44.55 ± 10.93 (24-69)	
Secondary school (n=11)	96.82 ± 10.52 (88-115)		45.64 ± 9.96 (35-69)	
High school (n=18)	102.78 ± 11.78 (86-122)		43 ± 10.30 (24-63)	
University or above (n=25)	108.84 ± 14.04 (80-124)		35.64 ± 12.86 (18-66)	
Health status				
Good (n=18)	107.61 ± 12.19 (77-122)	**0.001**	36.50 ± 10.09 (18-55)	**<0.001**
Fair (n=85)	90.41 ± 19.67 (52-24)		43.06 ± 11.46 (18-69)	
Poor (n=21)	87.67 ± 22.20 (42-122)		53.05 ± 11.65 (34-69)	
Income status				
Good (n=15)	111.87 ± 9.88 (88-124)	**<0.001**	39.60 ± 4.73 (18-66)	0.207
Moderate + Low (n=109)	89.77 ± 19.73 (42-123)		44.38 ± 11.76 (19-69)	
Presence of other chronic disease?				
Yes (n=103)	91.80 ± 19.92 (42-124)	0.472	45.12 ± 11.85 (18-69)	**0.011**
No (n=21)	95.57 ± 21.34 (53-121)		37.33 ± 12.01 (18-61)	
Duration of diabetes, years				
1-5 (n=20)	98.50 ± 14.03 (66-122)	0.381	41.20 ± 9.44 (26-63)	**0.005**
6-10 (n=19)	92.26 ± 18.68 (55-120)		37.79 ± 11.29 (18-65)	
11-15 (n=24)	95.92 ± 17.96 (63-124)		40.67 ± 12.98 (18-62)	
≥16 (n=61)	89.15 ± 22.63 (42-124)		47.75 ± 11.84 (19-69)	

Table III. The relationship between the sociodemographic and health-related characteristics of the patients and their total HLS and EDBS scores (Continued)

Characteristics	HL Total score	p	EDBS Total score	p
Types of diabetes treatment				
OAD (n=71)	95.93 ± 19.17 (53-123)	0.054	39.89 ± 10.43 (18-66)	**<0.001**
OAD + Insulin (n=34)	89.50 ± 19.93 (42-124)		49.32 ± 12.59 (18-69)	
Insulin (n=17)	83.65 ± 22.68 (46-115)		49.06 ± 12.84 (19-67)	
Diet only (n=2)	93.50 ± 17.68 (81-106)		44 ± 14.14 (34-54)	
Presence of chronic complications				
Yes (n=85)	89.45 ± 20.68 (42-124)	**0.015**	46.95 ± 11.73 (18-69)	**<0.001**
No (n=39)	98.97 ± 17.38 (55-122)		36.92 ± 10.29 (18-66)	
Presence of retinopathy				
Yes (n=45)	85.42 ± 21.94 (42-123)	**0.003**	50.58 ± 11.50 (27-69)	**<0.001**
No (n=79)	96.44 ± 17.97 (52-124)		39.94 ± 10.87 (18-66)	
Presence of nephropathy				
Yes (n=33)	85.30 ± 18.49 (46-115)	**0.009**	52.79 ± 9.10 (36-69)	**<0.001**
No (n=91)	95.03 ± 20.17 (42-124)		40.54 ± 11.54 (18-69)	
Presence of neuropathy				
Yes (n=51)	90.33 ± 21.69 (42-124)	0.415	48 ± 12.48 (18-69)	**0.001**
No (n=73)	93.92 ± 18.98 (53-123)		40.86 ± 11.15 (18-69)	
Presence of CAD				
Yes (n=29)	88.52 ± 7.86 (42-116)	0.143	50.27 ± 2.58 (19-69)	**0.001**
No (n=95)	93.64 ± 20.71 (46-124)		41.82 ± 11.42 (18-69)	
Diabetic foot				
Yes (n=7)	83.28 ± 22.86 (54-119)	0.231	50.28 ± 12.96 (31-67)	0.177
No (n=117)	92.99 ± 19.93 (42-124)		43.41 ± 12.09 (18-69)	
Diabetes education				
Yes (n=121)	92.38 ± 20.33 (42-124)	0.890 Not corrected for ties	43.73 ± 2.28 (18-69)	0.578 Not corrected for ties
No (n=3)	95 ± 10.39 (83-101)		46.67 ± 9.07 (37-55)	

Abbreviations: EDBS, Elderly Diabetes Burden Scale; HL, Health Literacy; CAD, coronary artery disease; OAD, oral antidiabetic drug

DISCUSSION

Many physical, emotional, mental, and social problems associated with T2DM, which is more frequent in elderly patients, lead to an increase in the burden of the disease. 15.6% of adults aged 65-69 and 58% of adults aged 85 have insufficient HL (21). Likewise, in our study, it was found that the level of HL decreased and the diabetes burden increased with advancing age.

Ovayolu et al. found that females have a higher burden of diabetes than males (22). Moreover, the quality of life of diabetic women is lower than men. Female diabetics have a more challenging time coping with the disease (23). Studies have revealed that diabetic women have higher hopelessness levels than diabetic men. These negative situations make women more likely to experience a more significant diabetes burden (24). Diabetes-related stress, depression, and anxiety are more prevalent in women than in men. In the study conducted by Hobfoll et al.

(25), there were indications that men utilized more limited coping strategies in response to stressful life events. Negative coping styles, namely resignation, protest, and isolation, were more common in women. Enzlin et al. (26) found that men used more problem-focused coping, less avoiding, less social support seeking, and less depressive coping methods. In most of these studies, emotion-focused and avoidance-focused coping seems more prevalent in women. Differences in diabetes complications between men and women may result from both biological differences and differences in diabetes self-care coping strategies (27). In our study, the EDBS score was also found to be higher in females. This result may be related to the fact that females are weaker in coping with the disease. Therefore, it can be thought that elderly diabetic females in our study have difficulties coping with the disease and feel more burdened.

In the study conducted by Üstündağ and Dayapoğlu, it was observed that female patients experienced more obstacles in drug use compared to male patients (28). Similarly, in our study, the burden of using diabetes medications was higher in elderly diabetic females than males. This result can be explained by the fact that women cannot establish the desired order because they have challenging roles that require responsibility, such as being a wife and a housewife.

In different studies, it has been found that females have higher HL than males (29), their level of accessing, understanding, and applying information about prevention from diseases and improving health is higher than males (30), and their efforts to learn about health issues are higher than men (31). Özonuk and Yılmaz found that the HL scores of males were higher than females (32). In a study, Bohanny et al. found no correlation between gender and HL levels, which is consistent with our study (33). This result suggests that elderly females and males are at a similar level regarding HL.

In this study, we found that the university graduate participants' HL level was higher. In different studies, researchers found that the HL level was lower in people with a lower education level (30,31,34,35). In our research, it was determined that the diabetes burden scale score differed according to educational status, and the symptom burden was lower in university graduate individuals. Akyol Güner et al. found that the diabetes burden was higher in elderly patients with low education (36). This result is compatible with our study. Unlike our study, in study, Bohanny et al. found that there was no relationship between education and HL (33). It is an expected result that educated individuals in our study have a lower diabetes burden and a higher level of HL, regardless of age. University graduates with T2DM are more likely to adapt to diabetes than those who are literate (37). Complex diabetes management regimens require significant lifestyle changes that are difficult even for educated patients (38). Therefore, patients with diabetes with better HL will have better lifestyle changes or adaptations to the disease.

Inadequate HL may contribute to a disproportionate increase in the burden of diabetes among disadvantaged populations (34). A study found that patients who assessed their health status as poor had lower HL scores (37). This result also suggests that elderly diabetic individuals have poor health status because of low HL. Although it is not clear how much HL level contributes or is causally related to the diabetes burden, we think that poor HL may directly contribute to adverse outcomes.

In a study, Akyol Güner et al. found that elderly patients with T2DM who stated their health status as poor had a higher diabetes burden (36). Similar to this result, our study also found that the disease burden of diabetes was lower in patients who assessed their health status as good.

A previous study determined that the diabetes burden of elderly patients with high-income status was lower (36). Our study found no significant relationship between diabetes burden and income. This result suggested that the income status of our patients did not affect their diabetes

burden. The symptom burden is expected to be higher in those with low income. Because people with low-income levels generally have lower literacy levels and lower access to health care. The insignificance in our study may be due to the deficient number of patients with low economic income (n=4).

According to the results of a study, the HL level of high-income elderly individuals was found to be high (31,39). In another study, Aslantekin et al. found that patients with incomes below the minimum wage had lower HL scores. Patients with poor economic status may also experience problems accessing resources. In particular, they may encounter obstacles in coping with chronic illness (40). In consistence with the results of these studies, our study also found that high-income patients had higher HL levels. This result suggests that a good income level leads to a high level of HL regardless of age.

Comorbid chronic diseases can create significant barriers to diabetes self-management. Thus, the diabetes burden of the patients increases (41). Consistent with the study mentioned above (41), our study also showed that the burden of diabetes was higher in the presence of diabetes and other chronic conditions. This result suggests that the increased number of chronic diseases with age makes it difficult for diabetic patients to fight the disease.

Schillinger et al. found that inadequate HL was associated with worse glycemic control and higher rates of retinopathy among patients with T2DM, consistent with our findings (34). A previous study found that patients who developed diabetes-related complications encountered more obstacles in coping with diabetes and had less knowledge of the disease (28). In line with this study, the presence of chronic complications was found to be associated with low HL in our study as well. It was found that retinopathy and nephropathy, which are chronic complications, were seen less frequently as HL levels increased. This result shows how important HL is in reducing the development of disease complications. In another previous study conducted with elderly diabetic patients, it was revealed that those who experienced complications had a higher diabetes burden (36). In our study, the presence of diabetes-related chronic complications was associated with increased disease burden, which is consistent with the mentioned study. In addition, retinopathy, nephropathy, neuropathy, and coronary artery disease complications were also found to be associated with an increased burden of diabetes. These results show that the complication rate and diabetes burden increase with age in elderly diabetic patients. In another previous study, it was reported that the burden of diabetes increased with the increase in the duration of diabetes diagnosis (22). Consistent with this study, in our study, the burden of diabetes was found to be higher in patients with a diabetes duration of 16 years or more. This is an anticipated outcome.

Symptom burden, social burden, and anxiety about diabetes were significantly higher in patients treated with insulin than in those treated with diet only (19). Our study found that the diabetes burden was higher in elderly patients who used insulin to cope with diabetes than in patients who used other treatments. In our research, in addition to symptom burden, social burden, and anxiety about diabetes, the burden from oral antidiabetics or insulin was also found to be high in elderly diabetic patients who were treated with insulin. The higher diabetes burden in elderly patients using insulin may be due to the difficulty in administering insulin therapy compared to other treatment options and the higher risk of hypoglycemia side effects.

A strong inverse correlation was found between HL and increasing age (21) in a study. In our research, this relationship was not found in elderly diabetic patients. Some studies reported that low HL increased the burden of diabetes and was associated with poor blood glucose control, more severe complications, weaker self-management of diabetes, weak patient-doctor relationships, and a longer duration of hospitalization (42,43). Consistently with these

studies, a moderate, negative, and significant correlation was found between the patients' total HL score and the total diabetes burden of disease in our study. This result shows that HL level affects the burden of diabetes in older patients.

Study Limitations

There are some limitations to our study. First, our study was a single-center study. Second, as the participants were elderly patients, they may have had difficulty understanding the questions. Third, some factors (social support, self-management, mental health, etc.) affecting the symptom burden were not evaluated. Finally, the answers may be biased since the researcher has read the questions asked to illiterate individuals.

CONCLUSION

In our study, it was determined that the burden of diabetes decreased as the HLlevel increased. To implement successful diabetes management, patients need to possess a combination of knowledge, skills, and positive attitudes. Treatment of elderly diabetic patients is more difficult owing to deterioration in psychological, physical, and cognitive functions and lack of adequate family or social support. Since the level of HL is lower in elderly patients with lower education and income levels and more diabetes-related complications, healthcare professionals should consider this when informing these individuals about T2DM management. Health professionals should focus on increasing HL so that elderly diabetic patients can lead a more comfortable life, increase their ability to cope and adapt, prevent diabetes-related complications, and reduce the burden of diabetes. Viewed from a multidisciplinary perspective, elderly individuals should be provided with the necessary support. It is essential to communicate more effectively with patients with poor HL and to more deeply identify the needs and competencies of patients with inadequate HL. For this purpose, more widespread implementation of chronic disease management programs should be provided for patients with poor HL.

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Conflicts of Interest

All authors have no potential conflicts of interest. Written permission was obtained from all non-authors and contributors named in the acknowledgment section.

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Ethical Decleration

This study was approved by the Medical Research Ethics Committee of Akdeniz University, Faculty of Medicine (Date: 26.12.2018- Approval Number: 921). All participants gave their informed consent at the beginning of the study.

Author Contributions

Concept: SG, AK, Design: SG, AK, Supervising: SG, AK, Financing and equipment: SG, AK, Data collection and entry: SG, Analysis and interpretation: SG, AK, Literature search: SG, Writing: SG, AK, Critical review: AK

REFERENCES

1. Beauchamp A, Buchbinder R, Dodson S, et al. Distribution of health literacy strengths and weaknesses across socio-demographic groups: a cross-sectional survey using the Health Literacy Questionnaire (HLQ). BMC Public Health. 2015;15(1):678.
2. Yılmaz M, Tiraki Z. Sağlık Okuryazarlığı Nedir? Nasıl Ölçülür? Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi. 2016;9(4):142–7
3. Bansal N, Dhaliwal R, Weinstock RS. Management of diabetes in the elderly. Medical Clinics of North America. 2015;99(2):351–77.
4. Neşe A, Bakır E, Samancıoğlu Bağlama S, et al. The effect of health literacy level on diabetes self-care ıntype 2 diabetes patients: A clinical based study. Turkiye Klinikleri Journal of Health Sciences. 2021;6(1):112–9.
5. Lee EH, Lee YW, Moon SH. A Structural Equation Model Linking Health Literacy to Self-efficacy, Self-care Activities, and Health-related Quality of Life

in Patients with Type 2 Diabetes. Asian Nurs Res (Korean Soc Nurs Sci). 2016;10(1):82–7.

6. Buzlu S. Diyabetin psikososyal yönü. In: Erdoğan S, editor. Diyabet Hemşireliği Temel Bilgiler. Istanbul: Yüce Yayın; 2002. p. 195–205.
7. Naeem Z. Burden of diabetes mellitus in Saudi Arabia. Int J Health Sci (Qassim). 2015;9(3):V–VI.
8. Charvat H, Goto A, Goto M, et al. Impact of population aging on trends in diabetes prevalence: A meta-regression analysis of 160,000 Japanese adults. J Diabetes Investig. 2015;6(5):533–42.
9. Tang YH, Pang SMC, Chan MF, et al. Health literacy, complication awareness, and diabetic control in patients with type 2 diabetes mellitus. J Adv Nurs. 2008;62(1):74–83.
10. Saeed H, Saleem Z, Naeem R, et al. Impact of health literacy on diabetes outcomes: a cross-sectional study from Lahore, Pakistan. Public Health. 2018;156:8–14.
11. Chen PY, Elmer S, Callisaya M, et al. Associations of health literacy with diabetic foot outcomes: a systematic review and meta-analysis. Diabetic Medicine. 2018;35(11):1470–9.
12. Shin KS, Lee E. Relationships of health literacy to self-care behaviors in people with diabetes aged 60 and above: Empowerment as a mediator. J Adv Nurs. 2018;74(10):2363–72.
13. RobatSarpooshi D, Mahdizadeh M, Alizadeh Siuki H, et al The relationship between health literacy level and self-care behaviors in patients with diabetes. Patient Relat Outcome Meas. 2020;11:129–35.
14. Akyar I, Agralı H. Diyabetli erişkin hastalarda sağlık okuryazarlığı: Ölçek geçerlik ve güvenirlik çalışması. Acibadem Universitesi Saglik Bilimleri Dergisi. 2018; 9(3):314-21
15. Akyol Güner T, Kuzu A, Bayraktaroğlu T. Diyabetli bireylerde sağlık okuryazarlığı ve akılcı ilaç kullanımı arasındaki ilişki. Turkish Journal of Diabetes and Obesity. 2020;4(3):214–23.
16. Sørensen K, Van den Broucke S, Pelikan JM, et al. Measuring health literacy in populations: illuminating the design and development process of the European Health Literacy Survey Questionnaire (HLS-EU-Q). BMC Public Health. 2013;13(1):948.
17. Toçi E. Health literacy and socioeconomic characteristics among older people in Transitional Kosovo. Br J Med Med Res. 2013;3(4):1646–58.
18. Aras Z, Bayık Temel A. Sağlık Okuryazarlığı Ölçeğinin Türkçe Formunun Geçerlilik Ve Güvenirliğinin Değerlendirilmesi. Florence Nightingale Hemşirelik Dergisi. 2017;25:85.
19. Araki A, Ito H. Development of elderly diabetes burden scale for elderly patients with diabetes mellitus. Geriatr Gerontol Int. 2003;3(4):212–24.
20. Usta YY, Esen A. A study of the validity and reliability of the "Elderly Diabetes Burden Scale" for the Turkish society. Turkish Journal of Geriatrics. 2012;15.
21. Mark L. Health literacy and the elderly. Osteopathic Family Physician. 2009;1(3):64–9.
22. Ovayolu Ö, Ovayolu N, Doğru A, et al. The Challenge of Diabetes in the Elderly and Affecting Factors. Holist Nurs Pract. 2015;29(5):272–9.
23. Çıtıl R, Günay O, Elmalı F, Öztürk Y. Diyabetik hastalarda tıbbi ve sosyal faktörlerin yaşam kalitesine etkisi. Erciyes Tıp Dergisi. 2010;32(4):253–64.
24. Kumcağız H, Ersanlı K. Diyabet Hastalarının Umutsuzluk Düzeylerinin Cinsiyet ve Eğitim Düzeylerine Göre İncelenmesi. Dokuz Eylül Üniversitesi Buca Eğitim Fakültesi Dergisi [Internet]. 2008;23:123-8.
25. Hobfoll SE, Dunahoo CL, Ben-Porath Y, et al. Gender and coping: The dual-axis model of coping. Am J Community Psychol. 1994;22(1):49–82.
26. Enzlin P, Mathieu C, Demyttenaere K. Gender differences in the psychological adjustment to type 1 diabetes mellitus: an explorative study. Patient Educ Couns. 2002;48(2):139–45.
27. Gåfvels C, Wändell PE. Coping strategies in men and women with type 2 diabetes in Swedish primary care. Diabetes Res Clin Pract. 2006;71(3):280–9.
28. Üstündağ Ş, Dayapoğlu N. Tip 2 diyabetli bireylerin hastalık yönetiminde karşılaştıkları engellerin değerlendirilmesi. Adnan Menderes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi. 2021;5(3):514–33.
29. Sudore RL, Mehta KM, Simonsick EM, et al. Limited Literacy in Older People and Disparities in Health and Healthcare Access. J Am Geriatr Soc. 2006;54(5):770–6.
30. Emre N, Arslan M, Edirne T, ve ark. Bir üniversite hastanesindeki aile hekimliği poliklinik hastalarının sağlık okuryazarlık düzeyleri ve ilişkili etkenler. Mersin Üniversitesi Tıp Fakültesi Lokman Hekim Tıp Tarihi ve Folklorik Tıp Dergisi. 2021;11(3):588–95.
31. Bayık Temel A, Çimen Z. Kronik hastalığı olan yaşlı bireylerde sağlık okuryazarlığı, sağlık algısı ve ilişkili faktörler. Ege Üniversitesi Hemşirelik Fakültesi Dergisi. 2017;33(3):105-25.
32. Özonuk E, Yılmaz M. Tip 2 diabetes mellitus tanılı hastaların sağlık okuryazarlığı ve tedavi uyumu arasındaki ilişki. Koç Üniversitesi Hemşirelikte Eğitim ve Araştırma Dergisi. 2019;16(2):96–103.
33. Bohanny W, Wu SFV, Liu CY, et al. Health literacy, self-efficacy, and self-care behaviors in patients with type 2 diabetes mellitus. J Am Assoc Nurse Pract. 2013;25(9):495–502.

34. Schillinger D. Association of health literacy with diabetes outcomes. JAMA. 2002;288(4):475.

35. Souza JG, Apolinario D, Magaldi RM, et al. Functional health literacy and glycaemic control in older adults with type 2 diabetes: a cross-sectional study. BMJ Open. 2014;4(2):e004180.

36. Akyol Güner T, Bayraktaroğlu T, Seval M. Yaşlı tip 2 diyabetli bireylerde diyabet yükünün incelenmesi: Zonguldak ili örneği. Turkish Journal of Diabetes and Obesity. 2020;4(2):108–18.

37. Özcan G, Ozkaraman A. Diyabetes mellitus hastalarında sağlık okuryazarlığı düzeyi ve etkileyen faktörler. Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi . 2020;14(1):3–16.

38. Powell CK, Hill EG, Clancy DE. The relationship between health literacy and diabetes knowledge and readiness to take health actions. Diabetes Educ. 2007;33(1):144–51.

39. Heijmans M, Waverijn G, Rademakers J, et al. Functional, communicative and critical health literacy of chronic disease patients and their importance for self-management. Patient Educ Couns. 2015;98(1):41–8.

40. Aslantekin F, Uluşen M, Kaplan B, et al. An Evaluation of Health Literacy Situations of Patients With Type 2 Diabetes. Medical Journal of Islamic World Academy of Sciences. 2013;21:105–14.

41. Funnell MM, Brown TL, Childs BP, et al. National Standards for Diabetes Self-Management Education. Diabetes Care. 2011 Jan 1;34(1):S89–96.

42. Chahardah-Cherik S, Gheibizadeh M, Jahani S, et al. The relationship between health literacy and health promoting behaviors in patients with type 2 diabetes. Int J Community Based Nurs Midwifery. 2018;6(1):65–75.

43. Bailey SC, Brega AG, Crutchfield TM, et al. Update on health literacy and diabetes. Diabetes Educ. 2014;40(5):581–604.